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DEVOTED TO NATURAL HISTORY, PRIMARILY
THAT OF THE PRAIRIE STATES

JULIUS A. NIEUWLAND, C.S.C., PH.D., SC.D.
EDITOR

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The American Midland Naturalist

Devoted to Natural History, Primarily that of the Prairie States

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The American Midland Naturalist

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Vol. X. JANUARY, 1926. No. 1.

STUDIES IN THE COMPOSITAE.

THEO. HOLM.

I. *Krigia Virginica* (L.) Willd.

(With three plates drawn from nature by the author.)

INTRODUCTION.

The North American *Compositae* have received much attention from a taxonomic point of view, notably in the fundamental works of Asa Gray and E. L. Greene. The genera are, at present, well understood, and the species described up to the recent time offer an excellent illustration of the vastness of the family on this continent. It now remains to study the biology of these plants, and it is the writer's intention to offer some contributions to the knowledge of this particular point by means of describing the structure, and, so far as possible, to compare this with the results gained by previous authors. However, we regret to admit that our contributions will be merely fragmentary, since it is so extraordinarily difficult to obtain any large quantity of material suitable for such studies, except what is accessible to us in this vicinity; moreover the necessity of preparing the specimens in "denatured alcohol" is an obstacle, quite troublesome indeed.

The anatomy of *Compositae* covers a great field. We need only to read the synopsis of the characteristics in Solereder's "Systematische Anatomie der Dicotyledonen" to realize the magnitude of the work that has been done, and what is still to be done. We notice the immense variations of even the simple structures, combined with others of a more complicated nature such as for instance the systems of oil-ducts, and latex-tubes, the structure of the stele etc., not speaking of the singular structure of the roots, a subject, which so far, is but very imperfectly known. The anatomical litera-

ture is copious, nearly all contributed by French and German investigators.

Concerning the external morphology of the family, we know very little about this matter. The European species have been studied, but only a relatively small number of really interesting structures have been observed; the seedling-stage, for instance, is remarkably uniform, and so very many of these plants are annuals, thus the further development of the plants offers little of interest. The floral structure, as described by Eichler, comprises only a small chapter of his work "Blüthen-diagramme" as compared with a number of the other families; the morphological identity of the pappus, however, is highly interesting, and some very instructive works have been contributed notably by Samsöe Lund and Koehne. Then, but quite recently, Briquet has called attention to the carpologic structure, containing many points of interest.

But so far as concerns the North American representation of the *Compositae,* the material accessible to the European investigators was too scant to be useful for any very comprehensive treatment, and consequently there is a wide field of research open for the students on this continent.

According to Gray, *Krigia* Schreb. comprises three sections, viz., *Cymbia* Torr. et Gr. (K. *occidentalis* Nutt.), *Eukrigia* Torr. et Gr. (*K. Virginica* (L.) Willd.), and *Cynthia* (D. Don) Gray (*K. Dandelion* Nutt., *K. montana* Nutt., and *K. amplexicaulis* Nutt.) The principal distinction depends upon the two former sections being annuals, the third perennial, besides the structure of the pappus: mostly 5-paleaceous and 5-aristate in *Cymbia;* 5 to 7 roundish paleae alternating with as many capillary, long bristles in *Eukrigia;* and finally in *Cynthia*: 10 to 15 oblong paleae and 15-20 slender, capillary bristles. While *Cymbia* is acaulescent, *Eukrigia* and *Cynthia* occur both as caulescent and acaulescent. *Krigia Dandelion* (L.) Nutt. is the only species in which vegetative reproduction is secured by means of tuberiferous stolons.

Krigia Virginica thus represents a monotypic section, and it would seem natural to consider it as such judging from the external structure; some authors, however, regard it as

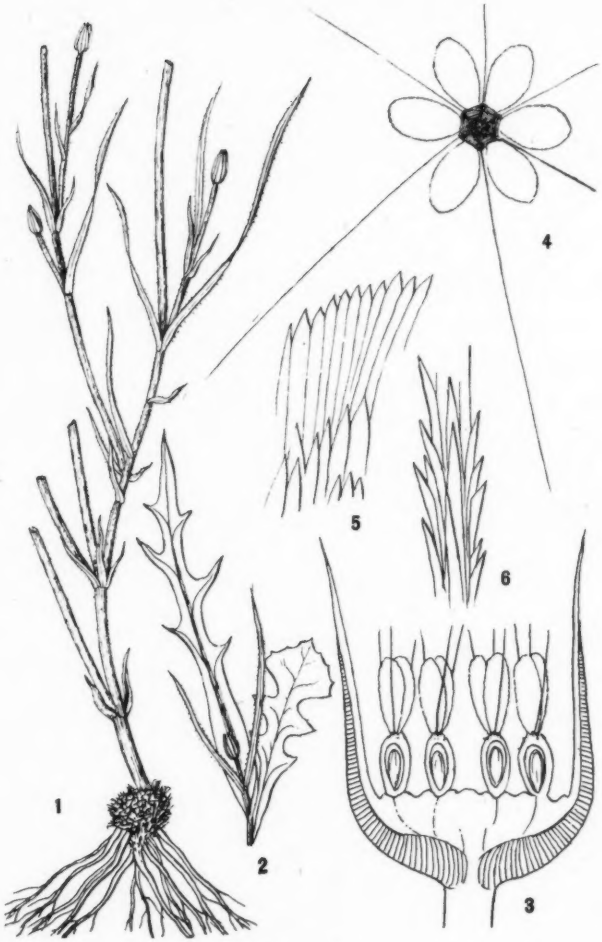


PLATE 1

Figure 1. Part of a plant at the aestival stage; natural size.
Figure 2. Axillary shoot from the vernal stage; enlarged.
Figure 3. Longitudinal section of the capitulum, partly schematic.
Figure 4. The pappus seen from above; enlarged.
Figure 5. Epidermis of the upper margin of the scale-like inner pappus; × 480.
Figure 6. Part of the bristle-like pappus; × 360.

a monotypic genus. The internal structure has not been studied, so far, of any of the members of *Krigia*, and if the present paper deals only with *K. Virginica*, the anatomical characteristics, which we have observed, may prove useful to some future investigator describing the anatomy of the other species. A comparative anatomical study of the genus might throw some light upon the actual position of the species, representing genera or merely sections.

The habit of *Krigia Virginica* is somewhat singular. The seeds germinate in the early spring; a rosette of leaves becomes developed, and several floral scapes appear from the axils of the leaves. Neither at the time of flowering nor of maturing the fruits is there any indication of a secondary stage to appear. The plants wither soon, and look completely dead for a month or so, until the latter part of June or early in July, when we notice the fields covered with a new vegetation of *Krigia*, abundantly flowering, but of a much taller stature, very prominently caulescent and profusely branched. It is a small part of this stage, which we have drawn, (Plate 1, figure 1), and which shows the persisting primary root, several strong, secondary roots, the vertical, very short and thick rhizome, and the basal portion of a branched stem with some heads and leaves. The foliage of the aestival stage consists of linear leaves, frequently opposite, glandular-hairy like the stems. In the vernal stage the leaves of the rosette are spatulate-obovate, entire or pinnately parted; they subtend small shoots (Fig. 2), which later on develop into tall, branched stems (Fig. 1).

While thus the habit of the vernal stage is different from that of the aestival, the structure of the capitulum and the flowers is the same in both. By Gray the involucre of the genus (*Krigia*) is described as "simple and naked, i. e., of equal bracts and no short calyculate ones at base" (Synopt. Flora of North America 2nd ed. 1888, p. 84); the involucre of the species (*K. Virginica*) is by this same author (l. c. p. 411) described as consisting of "9 to 18 bracts, thin, remaining narrow and nearly nerveless, reflexed after the fall of the akenes." Nothing is said about the bracts being arranged in two whorls, nor of the inner whorl subtending flowers. Nevertheless in the diagnosis of the family (*Com-*

positae, l. c. p. 48) Gray defines the involucre (periclinium of authors) as being "formed of separate sometimes connate reduced leaves, i. e., bracts, the innermost of these bracts subtend the outermost or lowest flowers." In other words, Gray did not restrict the term involucre to the barren bracts; the bracts subtending the disk-flowers were by Gray called "paleae, chaff, or simply bracts of the receptacle." In some few cases, however, Gray was unable to draw the distinction between the involucre and the paleae, for instance in the *Filagineae* (l. c. p. 57), where Gray speaks of: "a chaff (palea) or involucral bract enclosing or subtending each female flower or akene."

The term "involucre" has been used in two different ways: to apply to the barren bracts alone, or to include also the innermost whorl, which frequently is fertile. In the former case some genera: *Adenostyles* (*albifrons*), *Tagetes* and *Tragopogon* would have no involucre, since all the bracts subtend flowers; nevertheless these floral bracts show the general shape and structure of involucral bracts in general. This distinction originated with Cassini (1819) when he attributed "un involucre oligophylle" to *Filago*, *Gifola* and *Logfia*, describing the floral bracts as "bractées paléales." More recently Briquet* has brought the matter up again suggesting that the term involucre be reserved to the barren bracts "l'ensemble des feuilles steriles," and, bractées paléales to those subtending flowers. From a morphological viewpoint nothing is gained by accepting this terminology instead of the former, and nothing could be gained either. For the barren bracts as well as the floral, the latter, including also the paleae, chaff, or simply bracts of the receptacle, are homologous organs. It is true that the actual limit of the involucre has not been defined correctly in several cases, and that the adoption of the term paleaceus bracts would induce the Syantherologists to examine the flowers more carefully with respect to the actual position of the peripheral in proportion to the adjoining bracts. Wydler is the only author, so far, who has contributed to the knowl-

* Briquet, I. Le Critère différentiel des bractées involucrales et paléales dans la calathide des Composées. Arch. d. sc. phys. et nat. Tome 43. Genève, 1917. p. 432.

edge of this particular question in his excellent work: "Kleinere Beiträge zur Kenntniss einheimischer Gewächse (Flora, 1860)." The term "paleaceous," however, is somewhat misleading. It refers to something membranaceous as the glumes and palea in the Gramineae, as well as the chaff in the *Compositae*. But the outermost floral bracts in *Tubuliflorae* and *Liguliflorae* are in many genera of a firm structure, contain chlorenchyma and stereome like the barren bracts, and perform the same function as these, protecting the flowers, and sometimes facilitating the liberation of the fruits. It would seem more natural, we believe, not to restrict the term involucre to the barren bracts alone.

In Krigia Virginica the involucre consists of two whorls of bracts, the innermost subtending flowers. The barren bracts, from three to six, are linear and of the same length; they have a distinct midrib and several secondaries, but much thinner; capitate hairs (Fig. 7) are frequent on the dorsal face, especially near the base. The floral bracts, from four to seven, are of the same length as the barren, but they are glabrous and have broad membranaceous margins, and veiny like the others. The innermost flowers, most frequently 15, are bractless.

The achenium is narrowly turbinate, of a black color, most frequently pentangular, and hispid along the ridges. The pappus (Plate 1, fig. 4) consists most often of five hyaline, obovate paleae alternating with an inner whorl of many capillary, long bristles, at first erect, but at the maturity of the achenium horizontally spreading.

Internal structure of the vegetative organs.

The root-system. None of the numerous, secondary roots examined showed the original structure before the increase in thickness takes place. The increase has already begun, when the plant is beginning to bloom at the first stage. In the youngest roots the peripheral tissues from epidermis to endodermis were preserved, and still active. The epidermis is hairy, and there is a large-celled, contractile exodermis surrounding the cortical parenchyma, which consists of four to five strata, the cells thin-walled and very regularly arranged in radii towards the endodermis, with wide inter-

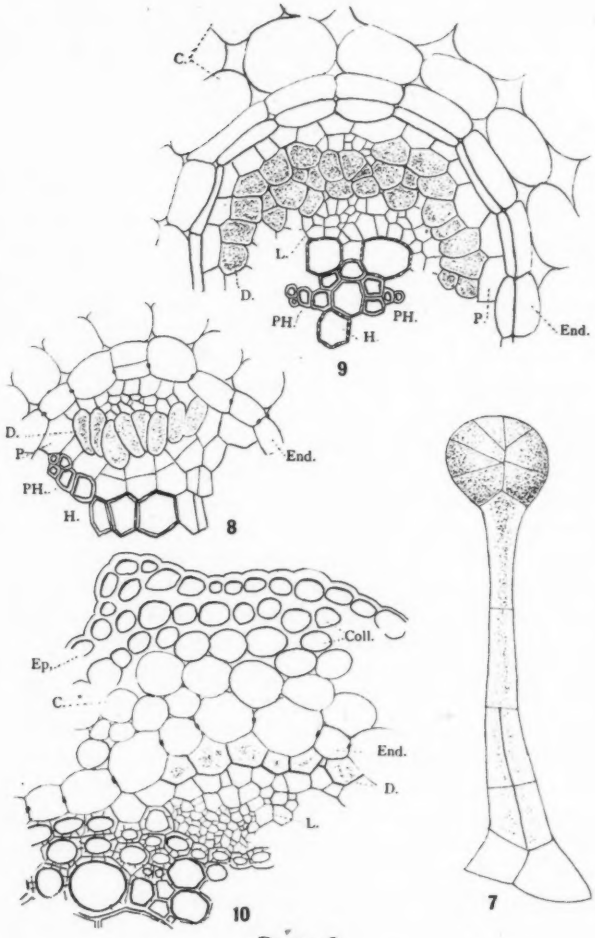


PLATE 2

Figure 7. Hair from the involucre; × 480.

Figure 8. Cross-section of a young root; End.=endodermis; P=pericambium; D=laticiferous ducts; P. H.=proto hadrome; H=secondary hadrome; ×600.

Figure 9. Cross-section of an older root; C=cortex; L=leptome; other letters as above; ×480.

Figure 10. Cross-section of a secondary scape; Ep.=epidermis; other letters as above; ×480.

cellular spaces, but with no deposits of starch. The endodermis is thin-walled, and does not contain starch (Fig. 8); the Casparyn spots are plainly visible, and, moreover, one cell outside each of the three primary leptome-strands, the root being triarch, shows a tangential division. The pericambium is thin-walled, and shows no divisions. With regard to the stele we observe (Fig. 8) on the thinner flank of the leptome a row of relatively wide laticiferous ducts, mostly seven or eight, and between these and the hadrome a meristematic tissue is visible with beginning cell-divisions. The hadrome is composed of three short rays of narrow proto-hadrome vessels extending from a central strand of about five, wide, porous vessels of secondary origin.

Characteristic of this root-structure is thus the beginning cell-division in endodermis, and the well-developed strands of latex-tubes inside the leptome.

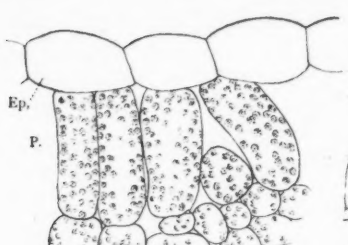
In a somewhat older root, the primary of a flowering specimen, collected early in April, the epidermis has become thrown off, replaced by the persistent exodermis; the cortex shows the same structure as described above, while the endodermis (Fig. 9) shows a tangential division in all the cells, resulting in the formation of a band of narrow, rhombic ducts corresponding with the oil-ducts of the *Tubuliflorae*, but containing no oil. The pericambium has remained intact, while the primary leptome-strands have become partly obliterated, replaced by secondary; the laticiferous tissue has increased considerably in size, forming two broad arches, separated only by a few parenchymatic strata outside the two rays of proto-hadrome; the secondary hadrome is represented by a few wide, porous vessels in the centre of the stele.

Finally, if we examine one of the thickest roots of a plant in its second stage collected in July, we observe the cortex and the endodermis to be very much compressed, while the pericambium is still intact. The laticiferous ducts, though much compressed, are readily to be distinguished as two separate arches, bordering on the pericambium, and enclosing the secondary leptome; the secondary hadrome occupies the greater portion of the stele as a compact tissue of numerous wide, porous vessels, interspersed with small strands of

thick-walled conjunctive tissue, and obscuring the primary hadrome almost completely.

We have thus in the root-system of *Krigia* a good illustration of the progressive increase in thickness beginning with the development of secondary hadrome (Fig. 8), followed soon after by enlargement of the laticiferous tissue and development of secondary leptome (L. in fig. 9) at the expense of the primary leptome, which becomes strongly compressed and finally obliterated. At the same time the cortical parenchyma and the endodermis become compressed, and the epidermis replaced by the exodermis. The pericambium remains intact, taking no part in the increasing growth in thickness. The actual increase is thus confined to the stele. With reference to the laticiferous tissue this shows the same position as in the roots of other members of the *Liguliflorae*. Very singular and almost unique is the development of ducts by the endodermis (Figs, 8 and 9). We have seen the first appearance of these ducts as a tangential wall in one cell of the endodermis outside each of the three strands of primary leptome, and finally that the cell-division takes place throughout the endodermis, when the secondary tissues have advanced in growth. These ducts thus correspond with those that are characteristic of the *Tubuliflorae*, even if they do not contain oil. It is a structure which, so far, has only been found in a very few members of the *Liguliflorae:* some species of *Scorzonera, Scolymus graduiflorus* and *Tragopogon porrifolius* (Van Tieghem.) On the other hand, cell-divisions in the endodermis, but without forming ducts, have been observed in *Cichorium Intybus* and *Lampsana communis*.

The aerial stem. The floral scape, during the first flowering (April), is almost cylindric with some, six to seven, shallow furrows, and glabrous. The cuticle is thin, smooth, and the outer cell-wall of the epidermis is slightly thickened. In the ridges the hypodermal stratum of cortex is collenchymatic, while the other, two to three, layers are thin-walled and contain chlorophyll, but no crystals; no palisade cells were observed in the cortex. There is no endodermis and no pericycle; the mestome-strands, six to seven large, and three much smaller, form a circular band, bordering inwards on



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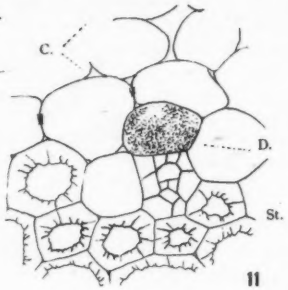

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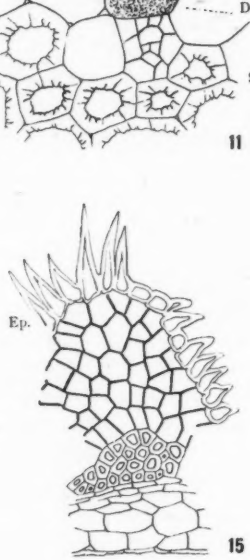

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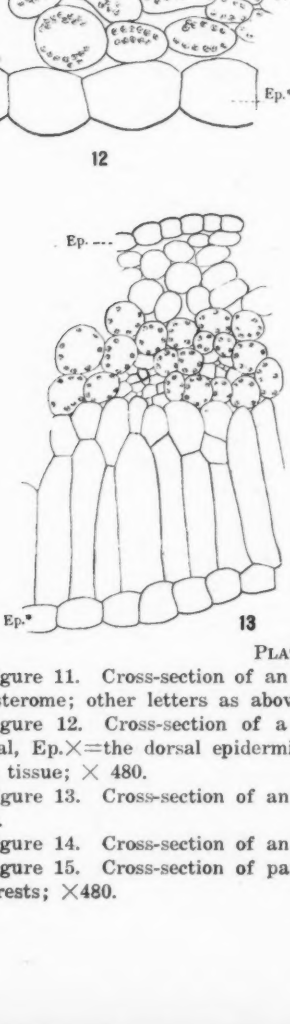

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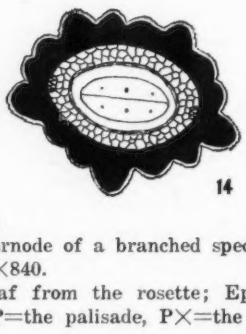

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PLATE 3

Figure 11. Cross-section of an internode of a branched specimen; St.=sterome; other letters as above; ×840.

Figure 12. Cross-section of a leaf from the rosette; Ep.=the ventral, Ep.×=the dorsal epidermis; P=the palisade, P×=the pneumatic tissue; × 480.

Figure 13. Cross-section of an involucral bract; letters as above; ×360.

Figure 14. Cross-section of an achenium; × 90.

Figure 15. Cross-section of part of an achenium, showing one of the crests; ×480.

a broad pith, hollow in the centre. Laticiferous ducts occur on the outer flank of the leptome, two to three in the larger, and one in the smaller strands. All the mestome-strands are of the collateral type, and the very short hadromatic rays contain only two to three spiral vessels, and a small strand of thin-walled parenchyma: endoxyle. The pith is homogeneous, thin-walled, and contains neither starch nor crystals.

The floral scapes of the secondary stage (July) are, as mentioned above, developed from the axils of leaves borne upon tall, ramified shoots (Fig. 1). They are obtusely hexangular, and very hairy from long, capitate hairs (Fig. 7). The cuticle, epidermis and cortex show the same structure as in the vernal scape, but the stele is here surrounded by a thin-walled endodermis, besides that a band of a few layers of stereome is located between the mestome-strands, though not of pericyclic origin. The laticiferous ducts show the same position as described above, on the outer flank of the leptome, but bordering here on the endodermis. There are 12 mestome-strands, six broad alternating with six thinner ones, and some of the thinnest (Fig. 11) may consist of leptome only, and with a single duct inside the endodermis.

The internodes of the branched shoot (Fig. 1) are hairy like the scapes, and cylindric, not furrowed. Their structure is almost identical with that of the scapes, but they lack hypodermal collenchyma, and the stele contains a circular band of 14 broad mestome-strands, all being of the collateral type. The endodermis is very distinct, and there is an interfascicular stereomatic tissue extending to the mestome-strands, and sometimes partly surrounding the hadrome of these.

According to Solereder the stem-structure of the *Compositae* is yet very imperfectly known, at least in a general way. The *Liguliflorae*, to which *Krigia* belongs, have been studied to some extent, however, on account of the frequent occurrence of bicollateral mestome-strands, which are not represented by *Krigia*. Very little is known about the structure of the cortex, and with regard to *Krigia* we have seen that this parenchyma is of the ordinary type in the scapes as well as in the internodes of the late, branching shoots.

There is no indication anywhere of a palisade-structure, although such might be expected in the late, branching shoots, of which the foliage is scantily represented in proportion to the length of the internodes and scapes, besides that all the basal leaves have withered, when the second blooming begins. The presence of an endodermis at the later stage, and its absence from the early is no unusual occurrence, for such may be observed in other plants, when we compare the apical internodes with the basal. We have failed to detect any pericycle in the stem of *Krigia*, although Solereder claims that the laticiferous ducts in the stem belong to this tissue. If such be actually the case, the pericycle would in *Krigia* be restricted to the mestome-strands, which would be contradictory in view of the name "peri-cycle." In the roots we have seen the ducts being located on the inner flank of the primary leptome, and later on covering the secondary leptome completely, thus bordering directly on the pericambium. Furthermore, when Sclereder states that secondary latex-ducts may be observed in the secondary leptome of stems, as well as in the periphery of the medullary leptomatic strands of certain *Cichoriaceae*, the origin of these ducts does not seem to be in any connection with a pericycle. With special reference to *Krigia* the latex-tubes appear to belong to the leptome, which certainly is in agreement with the opinion of Westermaier, that they occur most frequently, but not exclusively, in the albumen-conducting tissues of the mestome-strands.

The leaf. In some of the earliest developed leaves of the rosette a petiole is quite distinctly represented. Examined at the "characteristic point" just beneath the leaf-blade the outline of the petiole is obtusely triangular. The cuticle is thin and smooth; the outer cell-wall of the epidermis is slightly thickened on the dorsal face and along the margins; hairs of the same structure as those of the stem are frequent along the margins. With exception of a small strand of collenchyma in the dorsal keel the cortex consists of a thin-walled parenchyma of roundish cells, containing chlorophyll, especially in the margins. There are three collateral mestome-strands, of which the median is the broadcast. They are surrounded by large-celled parenchyma-sheaths, contain-

ing very little chlorophyll, besides that an arch of thin-walled stereome covers the leptome in the central strand. The laticiferous tissue is represented by seven to eight ducts in the central strand, located between the parenchyma-sheath and the stereome; in the two lateral strands the latex-tubes, mostly two, are located between the leptome and the parenchyma-sheath. The central strand contains four short rays of spiral vessels, and no endoxyle is developed.

The leaf-blade shows a bifacial structure so far as concerns the chlorenchyma, but not with regard to the distribution of the stomata. Viewed in superficial sections the lateral cell-walls of the epidermis are slightly undulate on the dorsal face, but nearly straight on the ventral; the stomata are most abundant on the dorsal face, and are surrounded by four ordinary epidermis-cells. No hairs were observed. Viewed in transverse sections (Fig. 12) the epidermis is relatively large-celled, thin-walled and covered by a thin, smooth cuticle; the stomata are slightly sunk. The chlorenchyma consists of a single layer of typical palisade cells covering an open pneumatic tissue of three strata, of which the cells are slightly lobed, when viewed in superficial sections. The midrib shows the same structure as the central strand in the petiole, but has only two or three laticiferous ducts. A colorless parenchyma occupies the greater portion of the keel, while the pneumatic tissue extends uninterrupted above the mestome-strand. Characteristic of the leaf of *Krigia* is thus the development of stomata on both faces, and the poor equipment with mechanical tissues; the location of the latex ducts between the stereome and the parenchyma-sheath in the midrib of petiole and blade thus differs from what we have observed in the stem, where the ducts bordered directly on the leptome and the endodermis. But neither in the endodermis of the stem nor in the parenchyma-sheaths of the leaf was there any indication of cell-divisions resulting in the formation of ducts, as was observed in the roots.

The outer bracts of the involucre show a structure very different from that of the proper leaves, on account of the function which they perform. We remember that the *Liguliflorae* at the time of flowering open and close the heads in the morning and evening, besides that the involucral bracts

become reflexed, when the achnia have matured. The opening and closing of the heads are effected by the movement of the bracts; the liberation of the achenia is effected by the reflection of the bracts, their dispersal facilitated by means of their pappus. A cross-section of an involucral bract (Fig. 13) shows a thin-walled epidermis on both faces; there are stomata on both faces, and long, capitate hairs are frequent on the dorsal face (Fig. 7). A large, compact, thin-walled, colorless parenchyma of two strata is located inside the dorsal epidermis, the outermost consisting of very high cells resembling palisades; a similar colorless parenchyma, but of roundish cells with distinct intercellular spaces is located inside the ventral epidermis. Between these two hypodermal colorless tissues we notice a typical chlorenchyma of four to five strata, the cells roundish and containing some chlorophyll. This parenchyma is traversed by several mestome-strands, arranged in a single plane; they have no mechanical support, and the leptome is much better represented than the hadrome, many of the strands being even purely leptomatic, as shown in the figure (to the right of the larger strand); no laticiferous ducts were observed in the bracts.

The floral bracts show the same structure, with exception of the considerably greater width due to the extension of the epidermis on both faces, forming very broad, hyaline margins. This structure of the involucre with the large, dorsal, colorless parenchyma extends from the base of the bracts to a little above the middle, however, is not restricted to the bracts, but is continued to the base of the receptacle, thus surrounding the head completely. The schematic drawing (Fig. 3) shows a middle, as shown in the longitudinal section (Fig. 3). This tissue, however, is not restricted to the bracts, but is continued to the base of the receptacle, thus surrounding the head completely. The schematic drawing (Fig. 3) shows a head with young, immature achenia, and with the bracts still erect; at this stage the scale-like pappus as well as the bristles are erect. So soon as the achenia have matured, the bracts become strongly reflexed, and this movement is effected by the partial collapsing of the dorsal, colorless tissue at the base of the bracts. The movement of the bracts at sun-

set and sunrise depends upon the relative atmospheric moisture becoming absorbed by the cell-walls, thus causing a swelling of the cells, and consequently a closing of the involucre, while at sunrise the movement in the opposite direction is caused by a partial loss of the water imbibed. It is for the same reason that the bracts become reflexed, when the achenia have matured: they wither, losing the content of water completely. At this very moment the pappus opens, occupying a horizontal position, through the mechanical effect of the articulus, where the pappus is attached to the pericarp, and evidently caused by the same change of moisture condition.

The achenium is turbinate, of a dark, almost black color. A cross-section from the median part (Fig. 14) shows an approximately pentagonal outline with five prominent crests alternating with five pairs, lower and more obtuse. The epidermis (Ep. in fig. 15) is thick-walled and extended into erect, pointed papillae, especially along the crests. The mesocarp, drawn black in the figure (14) consists of many strata of sclereids; in the five prominent crests (Fig. 15) only the innermost strata of sclereids are very thick-walled and porous, the peripheral being relatively thin-walled, but the cell-walls of a deep brown color. In the lower crests the complete tissue is uniformly and very thick-walled. The endocarp (Fig. 15) is of a few strata of thin-walled parenchyma traversed by two very thin mestome-strands. A dark-colored, compressed and collapsed tissue represents the border of the central cavity, the caelum with the cotyledons.

The scales of the pappus (Figs. 4 and 5) consist only of epidermis, which on the upper face is extended into pointed papillae, but no mestome-strands are developed. The bristles are also papillose (Fig. 6), and destitute of mestome-strands.

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SUMMARY.

In *Krigia Virginica* (L.) Willd. the involucre is represented by two whorls of bracts, of which the exterior are barren, the interior, on the other hand, subtending flowers. The shape and structure of the involucral bracts is identical with the only exception that the interior have broad hyaline margins. Both whorls perform the same function, facilitating the opening and closing of the capitulum, as well as facilitating the liberation of the achenia by becoming reflexed at the maturity of these. We see no reason why the interior bracts should not be termed involucral, even when they subtend flowers. If any such distinction should be drawn between these two whorls of bracts, there would be no involucre developed in species of *Adenostyles, Tagetes* and *Tragopogon*, where all these bracts are fertile. There are, of course, some cases where it is difficult to define the constituents of the capitulum with reference to the bracts, as, for instance, in *Xanthium* and *Ambrosia*. But in the majority of the *Compositae* the involucre is well differentiated; even where the interior whorl subtends flowers, these bracts show but seldom the same delicate structure as the paleae or chaff of the receptacle. We believe the term involucre is more significant, when not restricted to the barren bracts alone, and so long as the term involucral bracts, barren or fertile, does not convey the idea that they are morphologically distinct, this term ought to be retained.

Characteristic of *Krigia Virginica* are two well-marked stages of vegetation: a vernal and an aestival but with no modification of inflorescence or flowers. Of these the latter stage furnishes an illustration of the means by which an annual plant may persist for some months longer and bloom for a second time. This is effected by the development of a series of tall, branched shoots with many axillary scapes terminated by capitula, but with no subterranean structures, such as stolons, for instance.

As a member of *Liguliflorae, Krigia* has a system of articulated latex-tubes in root, stem and foliage. In the root these tubes appear at first on the inner flank of the proto-leptome (Fig. 8), extending from there to the pericambium, thus encircling the secondary leptome (Fig. 9). In the stem the latex-tubes are located between the leptome and the endodermis (Fig. 10). In the petiole and blade of the leaves of the rosette the latex-tubes follow the mestome-strands, and are located between the parenchyma-sheath and the stereome, that covers the leptome.

Besides these latex-tubes, *Krigia* has, furthermore, a system of endodermal ducts in the root (Figs. 8 and 9), which at first are noticeable by a tangential cell-division in endodermis, but only in a single cell

outside each of the primary leptome-strands; in older roots (Figs. 9) the whole endodermis shows cell-divisions resulting in the formation of a band of ducts corresponding with the oil-ducts in the roots of *Tubuliflorae*, but containing no oil. This very rare structure has also been observed in *Scorzonera*, *Scolymus* and *Tragopogon*, according to Van Tieghem. Conversely, latex-tubes have been found in the stem and leaf of *Gundelia*, a member of the *Tubuliflorae*, which lacks oil-ducts.

According to Solereder,* O. G. Petersen,** and several other authors, a number of *Liguliflorae* have leptome-strands in the pith of the stem, but these were not observed in *Krigia;* on the other hand, a more or less distinct endoxyle occurs in the aestival stage, but no internal leptome. Considering the fact that the aestival stage is so very scantily provided with foliage, we expected to find the cortex differentiated as a palisade-tissue, which is characteristic of similar more or less naked stems, but such was not the case with *Krigia.*

* Systematische Anatomie der Dicotyledonen. Stuttgart, 1899.

** Bicollaterale Karbundter. Thesis Kjoebenhavn, 1882.

Considered altogether, our *Krigia* possesses a complex of interesting structures, external as well as internal, which, if confined to *K. Virginica,* might be sufficient for considering the genus monotypic, as has been suggested by several systematists. It will, however, be necessary to study the other species in the same manner, and we hope some future investigator may be in the position to do so with more complete material accessible.

BOTANICAL GLEANINGS IN MICHIGAN.

III.

OLIVER ATKINS FARWELL.

The vernal season of 1925 opened some two or three weeks earlier than in the two preceding years and as the weather was warm and rain scarce, we got away to a flying start, so to speak, in field work. The early spring flowers, such as Spring Beauty, Purple Cress and Yellow Adder's-tongue, were out along the Ohio border by the middle of April, though not in the immediate vicinity of Detroit until a week later. The Wild Chervil is one of our rarer spring flowers; it has a specific name, *procumbens*, that is a misnomer as applied to our Michigan denizens. Here, the plants are erect or rarely decumbent, never procumbent. At the time of flowering, the Fringed Violet is one of our smallest and least conspicuous of violets. It is rather scarce, too, and liable to be overlooked as the plants are mostly single and widely scattered; occasionally they are larger, bunched and conspicuous but this condition is a rarity. It is found in sandy grounds.

It seems that our Common Blue Violet is very much of a cosmopolitan, adjusting and acclimatizing itself to any moisture degree and light; it is solitary or caespitose, then forming dense mats, and found in the shade of groves on alluvial lands whence it passes by degrees onto drier lands of banks and hillsides and into glaring sunlight; it makes its home with equal facility in the pure coal cinders of electric roads. The color of the rather large flowers is from deep violet-purple to pale violet-blue.

The Box Elder or Ash Maple is common in cultivation as a shade tree in our cities and villages; also, it is one of our native wild trees; but is much less frequent as such than as a cultivated tree. It inhabits the alluvial grounds near streams.

On May 6th we were overtaken by a snow-storm of short duration near Milan. Mostly the day was characterized by frequent showers of cold rain. We were rewarded by find-

ing Ginseng, not yet in flower, and *Trillium cernum* var. *declinatum* and its color forms, all in abundance. Milan is partly in Washtenaw County and partly in Monroe County. Our botanizing was in Monroe County. We observed some Cottonwood trees in excellent fruit but were unable to collect specimens as the trees were too large to shin up the trunk to where the fruit was. At Utica, *Trillium erectum* and *T. grandiflorum* were abundant. A few specimens of the white flowered variety of the former were found but not one of the variations of the latter was in evidence. The Black Poplar was observed along roadsides about two miles north of Utica. Other plants observed near Utica were the Dwarf Ginseng, the American Fly Honeysuckle, the Flowering Dogwood, the Small Yellow Lady's Slipper, the Bracted Green Orchis, and the dwarf Shadbush. At Inkster we found a small but interesting Beech woods that will soon be numbered with the everlasting past. Sidewalks of cement construction were already laid at regular intervals throughout. We observed some Sugar Maples whose bark had been punctured by a sap-sucker; the holes were about half filled with plugs of new bark.

The first ripe, Wild Strawberries were observed on May 27; on the same day the first Ox-eye Daisy and the first Yellow Pond Lily were seen in bloom. Also, on this day, I left my pocket knife at the foot of a *Crataegus succulenta* from which I had been cutting some specimens.

June 3rd was an extremely hot day but we were recompensed for this discomfort in a measure by finding a genus of plants, *Wolffia*, that we had never before seen in its natural habitat. It was associated with *Spirodela* and *Lemna trisulca*. In Commerce township, the most interesting find was *Matricaria suaveolens* called Pineapple Weed from a fancied resemblance of the odor to that of Pineapple. It seems to us to have the ill-scented odor of Dog Fennel. *Arenaria serpyllifolia* was common and in full bloom, the petals being not more than one-half the length of the sepals which is their usual size in this section of the country. *Cypripedium bulbosum* (*C. flavescens*) was in bloom but only two plants were seen. *Potentilla intermedia* was more or less plentiful. *P. Canadensis*, in rich woods, was *erect* about

eighteen inches high with no sign of a procumbent tendency; but after collecting and before pressing the tips had begun to curl. *Phlox pilosa* was frequent along the banks and some plants had very pale, almost white flowers. In Nankin township along the Venoy Road, we found June 10, what was left of an old residence, a stone-lined well, covered over, and the cellar with its stone walls; this latter was overgrown with trees and shrubs. The largest tree was a Poplar about twenty feet high with a diameter of 10.5 inches near the ground. In the cellar was a young *Catalpa cordifolia* J. St. Hil. (No. 7415b), about five feet high, the first instance I have seen of the self-seeding of this species. Nearby was a large specimen of the tree (No. 7415a), undoubtedly planted there when the one-time residence was occupied. Evidently one seed from this persistent tree found lodgment in the old cellar and the proper conditions for its germination.

At Algonac and vicinity on June 17, we found some interesting material. *Plantago Purshii* was gathered, this being our first acquaintance with it as a Michigan plant. Small, or dwarf specimens were only 11 lines high ending in a single flower. Associated with it was *P. Virginica*, the largest specimens of which were three inches high with leaves ten lines long and the smallest eleven lines high with two flowers. Also we found here *Viola Missouriensis* of the "Manual" in excellent summer stage. It is what Dr. Greene pointed out to me at one time as probably his *V. Dicksonii*. Very delicate forms of *Bromus secalinus* varied from two to eight inches in height and the inflorescences terminating the culms were reduced to a single spikelet.

Hieracium venosum was plentiful in copses. The leaves are variable in the amount of purple coloring matter which they show; some plants have the leaves nearly purple throughout and others vary in all stages to those that are green throughout.

The Yellow Sweet Clover, *Meliotus Meliotus-officinalis*, is frequent in southeastern Michigan but probably not in its typical form. Here the plant is never over two feet in height, usually much lower and with numerous short, ascending branches or none; flowers, 2 to 2.5 lines long. This form is probably the variety *confertus*. Another form most-

ly spreading on the ground with flowering racemes eight inches or so high, is probably the variety *arvensis*. The corollas of *Tradescantia reflexa* are red in some plants, blue in others. *Hordeum jubatum*, Squirrel Tail Grass, is sometimes a full yard in height. *Cirsum arvense* var. *integrifolium*, was observed in Maybee. *Persicaria villosula* is frequent at Flat Rock. A large stand of Lovage, *Levisticum Levisticum*, is near the west end of Mullet Lake. This was observed from the train window while on my vacation. Headquarters were at Lake Linden on Torch Lake, Houghton County. Several interesting things were found there.

On July 29, we made a trip to the lime pits near Maybee in search of *Sarothra* and *Xyris* but were unable to find them. The station evidently has been destroyed. In a previous paper, I mentioned a cut leaved *Silphium* at Sheldon guessed to be *S. laciniatum;* it was found in flower August 12, and the flowering plant proved our guess to have been correct; Mr. Gladewitz found it the same day at Eloise. Mention was made of *Sedum Fabaria*. Plants with subternate leaves when transplanted produced plants with opposite and alternate leaves respectively and the branches of the latter bore opposite leaves. Near Rochester, we found in fields the rare *Hieracium canadense* var. *macrophyllum*, on September 30. The leaves are much larger than in the species, less denticulate and of a different shape. Also dwarfed forms of Asters with one-flowered stems were numerous; these were of *A. azureus*, No. 7668, *A. laevis* var. *laevigatus*, No. 7669, (also at Ypsilanti, No. 7684, Oct. 14, '25), and of var. *amplifolius*, No. 7670. The latter was also found at Goodison, No. 7679 and at Goodrich No. 7674, September 23, *Gentiana crinita* was found at Geddes, No. 7694, only an inch and a quarter high, rather more than one-half of which was taken up by its single flower.

The last trip of the season was made October 14. The dam across the Huron R. at Geddes was destroyed or else the gates were wide open since the river was flowing within its natural banks and many acres of land that for many years have been four feet or more under water were again uncovered. An old wagon road and a lone buggy wheel were exposed, the former for several hundred yards. A number

of people were scattered along the length of the old road fishing in the shallow pools, an experience they will probably enjoy commenting upon for many years to come.

The reappearance of many unsuspected stumps and the blackened and decaying water vegetation gave an aspect of bleak desolation to a vast landscape.

Where the year of collection is not given, it is to be understood that Farwell and Gladewitz are the collectors and the year, 1925.

Botrychium dissectum Spring. Plentiful in a small woods near Disco. Nearly all plants had the preceding year's frond, now yellow and collapsed, still attached; only three or four plants had developed a fertile frond. A close scrutiny disclosed but a few specimens of the var. *elongatum* (Gilbert and Harberer) Farwell and none of these had produced a fertile frond. In this instance, the dissected form was about ten times as plentiful as the form with entire segments and was the only form to bear a fertile frond. Which is the mutant? Nos. 7527 and 7528 respectively, August 19.

Digitaria linearis (Linn) Pers. It seems probable that the Linnaean species was a mixture of two different plants, —the *Panicum Dactylon* and the *Panicum Ischaemum*. With the Bermuda Grass element removed, there is no obstacle to the continued use of the Linnaean name for the Crab Grass element. It has been collected near Ypsilanti by *Billington, Farwell,* and *Walpole* No. 5354, August 31, '19; *Farwell* and *Gladewitz* at Redford, No. 7245, October 8, '24; and at Oxford, No. 7618, September 2, '25; and by myself as follows:

Birmingham, No. 1576, September 9, '97; Belle Isle, No. 1576a, September 15, '97; Rochester, No. 4584, September 12, '17; Farmington Junction, No. 7632, September 9, '25.

Digitaria sanguinalis (Linn) Scop. Crab Grass. This is one of our commonest weeds. Often two feet in height with as many as 16 to 20 spikes arranged in several whorls or subwhorls, or scattered; the spikes are often six inches or more long. Belle Isle, No. 1267, July 21, '92; Ypsilanti, No. 1267a, June 27, '94; Detroit, No. 7634, September 10, '25.

Digitaria sanguinalis var. *repens* (Asch. & Grebn.) A variety that has shortened culms and spikes lying flat on the

ground; spikes 2 to 5 and about 2 inches long. Detroit, No. 7635, September 10, 1925.

Panicum Liebergii (Vasey) Scribn. Found on dry grounds at Ypsilanti. No. 7371, May 27, 1925, Sandy roadsides at Algonac, No. 7416, June 17.

Panicum clandestinum Linn. We collected this species in excellent flowering stage where we had it the preceding autumn after the fruits had fallen. Algonac, No. 7257, June 17. I collected it here in good fruit, No. 3889, September 13, 1914.

Phalaris Canariensis Linn. Hop Grass. The Canary Grass of the gardens. On the shores of Torch Lake, No. 7474, July 20, 1925. Detroit, on waste grounds. No. 1413, August 18, '93.

Alopecurus geniculatus Linn. Marsh Foxtail. In a moist depression associated with *Polygounm amphibuim* f. *terrestre* and f. *Hartwrightii* at Commerce. This is the first time I have seen the typical form of this species in Michigan. No. 7394, June 3.

Sporobolus neglectus Nash. Rush Grass. This species is quite frequent in southeastern Michigan. It has been collected at Detroit, No. 1681, September 24, '00; by *Farwell, Ford* and *Walpole* at Grosse Isle, No. 5989, August 31, '21; by *Farwell* and *Gladewitz* at Stony Creek, No. 6013, September 14, '21; at Rochester, No. 6866, October 17, '23; at Northville, No. 6458, October 18, '22 and at Goodison, No. 7677, September 30, 1925.

Sporobolus vaginaeflorus (Torr.) Wood. Rush Grass. In 1919, this species was common in the sand pits northwest of Rochester where it attained a very luxurious growth. It is no longer found in the pits but it is plentiful on the undisturbed adjacent grounds much reduced in size. No. 7661, September 30. *Farwell and Walpole* No. 5390, September 4, 1919. Clifton, No. 849 1-3, July 1, '95.

Eragrostis pectinacea (Mx.) Steud. This handsome species of grass was found in abundance at Royal Oak by *Billington and Farwell*, No. 5586, August 12, 1920.

Bromus secalinus Linn var. *Gladewitzii*, n. var. Chess. Slender, simple, up to 8 inches in height, leaves small, about an inch long, sparsely long hirsute above and ciliate, culm

terminated by a single, erect, ovate spikelet 7-lines or less in length, of 2 to 6 florets about 3 lines long, awnless. Edgewater Park, No. 7434, June 17.

Carex brunnescens (Pers.) Poir. A slender but stiff species allied to C. *canescens* but green instead of glaucous and with ultimately brown perigynia which have more distinct beaks. Eloise, No. 7408, June 10. Previously collected in Keweenaw Co., No. 625, July 26, '88 and No. 625a, Aug. 12, '88.

Carex brunnescens var. *sphaerosthachya* (Tuckerm.) *Kükenth.* (Var. *gracilior* Britt. and *C. canescens* var. *vulgaris* Bailey.) Amply distinct as a variety. It is more slender and weak, with spreading stems often prostrate, and has longer beaked, more spreading, *green* perigynia. Inkster, No. 7350, May 20. It has been previously collected in Keweenaw Co., No. 605, Sept. 12, '87, and at Port Huron, No. 4981, June 23, '18.

Carex Deweyana Schw., var. *stricta* Farwell. The culms in this variety are erect and but little longer than the leaves, some shorter. Near Utica, No. 7336, May 13.

Carex gracillima Schw., var. *humilis* Bailey. A low form with short, erect spikes. Inkster, No. 7344, May 20.

Carex tetanica Schk., var. *Woodii* (Dew.) Bailey. A very slender and lax, shady woods form of the species. Inkster, No. 7345, May 20.

Arisaema triphyllum (Linn) Schott, var. *viride* (Englr.) Farwell. Indian Turnip. A variation of the species with green spathes. Inkster, No. 7347, May 20. Several leaves were found with the lateral leaflets 2-divided.

Wolffia Columbiana Karst. Duckweed. On a small, probably artificial, and more or less stagnant lake in west Bloomfield township No. 7401, June 3.

Juncus effusus Linn, var. *compactus* Lejune and Courtois. At Eagle River, No. 7488, July 21, 1925; Clifton, No. 465a, August, 1900; Belle Isle, No. 465b, July 10, 1893.

Juncus Greenei Oakes and Tuckm. This looks something like *J. interior* but is darker green, coarser and rigid. In sand in Nankin, No. 7409, June 10. Previously collected in Keweenaw Co., No. 464, Aug. 30, '86; at Ypsilanti, No. 5274,

July 13, '19; Royal Oak, No. 5589, Aug. 19, '20; Monroe, No. 5909, July 6, '21.

Juncus Torreyi Coville, f. *longipes* Farwell. On the banks of the Rouge at Dearborn, No. 7515, Aug. 6.

Juncus alpinus Vill., var. *fuscescens* Fernald. In sand near Rochester, abundant; No. 7662, Sept. 30.

Unifolium bifolium (L.) Greene. Usually called Lily-of-the-Valley. The typical form with pubescent stem and leaves (on the under side) seems to be the prevailing form in southeastern Michigan. Commerce, No. 7390, June 3. Also, at Ypsilanti, No. 7381, May 27, 1925. The glabrous form, var. *Canadense* (Desf.) Farwell we found at Eloise, associated with *Viola latiuscula* and *Commandra Richardsoniana*. No. 7359, May 20.

Trillium erectum Linn. Bethroot. We found quite a little variation in this species. The peduncles, four inches or less in length, were mainly ascending or erect, but some were horizontal, and others reflexed, completing a range of half a circle. One rhizome with two stalks had one erect peduncle and one reflexed. Another with three stalks had peduncles erect, ascending, and horizontal. The largest leaf measured 6.25 inches across, the smallest 1.25. The largest pedal was .875 of an inch wide by 2 inches long, and the smallest .25 by .50. The stamens were shorter than the stigmas at the beginning of anthesis, increasing irregularly during the process, so that some were longer, some shorter, but all longer at the close of anthesis. The filaments were mostly very short, but some were nearly as long (.2 to .8) as the anther. In rich woods near Utica, Nos. 7327, 7328, 7329, and 7341, May 13.

Trillium erectum var. *album* (Mx.) Ph. This has white or cream colored petals and stamens, and a purple ovary. The filaments nearly as long as the anthers. Rich woods near Utica, No. 7332, May 13.

Trillium cernuum Linn, var. *declinatum* (A. Gr.) Farwell. In woods south of Milan. Peduncles from .25 to 1.5 inches in length, about one-third ascending, one-third horizontal, and the other third recurved, often crossing the stem beneath the leaves; the flowers of the horizontal peduncles were just below the leaves. No. 7315, May 6.

Trillium cernuum var. *declinatum* f. *Walpolei* Farwell. Peduncles .5 to 1.25 inches in length mainly recurved, and the purple flowers below the leaves. No. 7316, May 6.

Trillium cernum var. *declinatum* f. *Billingtonii* Farwell. Peduncles .75 to 1.875 inches in length, mainly recurved, and the brownish flowers below the leaves. No. 7317, May 6.

Sisyrinchium albidum Raf. The type locality according to E. P. Bicknell is West Kentucky where the species is always white flowered. This white flowered type I have seen for the first time in Michigan this year. It was in rather dry fields at Ypsilanti; No. 7368, May 27, 1925. The prevailing form of the species in Michigan has pale blue flowers and may be known as forma *coeruleum* n. f. Keweenaw Co., No. 461, Aug. 30, '86; Belle Isle, No. 461a, May 31, '93; Parkedale, No. 2699, June 11, '12.

Habenaria orbiculata (Pursh) Torr. Dinner Plate Orchis. In woods near Disco. Rare. No. 7524, Aug. 19. Previously collected near Farmington, No. 6142, May 23, '22; Copper Harbor, No. 3999, July 8, '15; Clifton, No. 3067, Aug. 22, '12. No. 358, collected at Clifton, Sept. 15, 1885, as this species, is *H. macrophylla* Goldie.

Corallorrhiza maculata Raf., var. *intermedia* Farwell. Frequent in dry woods at Oxford. No. 7605, Sept. 2

Salix longifolia Muhl. Sand Bar Willow. *Gray's New Manual* emphasizes the character of *two to three teeth to each cm. of margin;* the teeth are often as high as twelve to the cm. of margin at time of flowering. It is an unstable character and of no value. Eloise, No. 7363, May 20. Monroe, No. 7304, April 29, 1925.

Salix candida Flugge. Sage Willow. Frequent in bogs. *Farwell and Gladewitz* at Hamburg, No. 6769, Sept. 5, '23, and at Goodrich, No. 7650, Sept. 23, '25. I have it from Orion, No. 978, May 30, '95; Detroit No. 978a, July 24, '95; and Parkedale, No. 2557, May 19, '12.

Populus canescens Sm. White Poplar. This is plentiful near Goodrich where it has become naturalized as an escape from cultivation. No. 7640, Sept. 23.

Populus nigra Linn, var. *Betulifolia* (Ph.) Torr. Black Poplar. Evidently these trees have been planted along roadsides as shade trees. Three or four near a dwelling and an

equal number a half mile away along a roadside fence row. Young trees in the immediate vicinity indicate suckering. The outer bud scales are dry but the inner scales and young growths are viscid aromatic or balsamic; the leaves are pubescent throughout; the blades are rhombic-triangular, broadly cuneate at base, long acuminate at apex and longer than broad. The capsules are ovoid, acute, on pedicles about one half their length. About 2 miles north of Utica, No. 7340, May 13.

Myrica Gale Linn. The Sweet Gale is a native of swamp regions. We have two varieties in Michigan; the typical variety has the leaves pubescent underneath. Keweenaw Co.; Clifton, No. 29, July 10, 1883; Copper Harbor, No. 1615½, Aug. 24, '98; Phoenix, No. 1833½, August '04.

Myrica Gale var. *subglabra* (Chevalier) Fernald. This variety has the leaves glabrous underneath. As yet, we have observed it at only one place, the swampy borders of Cass Lake in Oakland Co., where it was first detected by Mr. Billington of Detroit, in 1916. No. 4255, June 29, '16; *Chandler and Farwell*, No. 5229, June 5, '19; *Farwell and Gladewitz*, No. 7223½, Oct. 1, 1924.

Alnus incana (Linn) Moench. The Common Alder of Michigan. Leaves glaucous underneath. Swamps near Eloise No. 7357, May 20.

Alnus incana var. *Americana* Regel. Alder. Along the borders of streams. Leaves green underneath and more densely pubescent, some more or less obovate. Rarely seen in the southeastern part of Michigan. Near Utica, No. 7325, May 13.

Rumex Mexicanus Meisn. Shores of Torch Lake, No. 7467, July 20, 1925; Rochester, No. 229b, June 30, '09; Keweenaw Co., No. 229, June 20, '85; Pontiac No. 5269, June 29, '19; Detroit, *Billington and Farwell*, No. 5092 July 14, '18.

Polygonum Fowleri Robinson. Has the prostrate habit of *P. littorale* but has longer, narrower, different colored leaves, rose sepals and exserted achenes. Sand banks, shores of Torch Lake, No. 7476, July 20, 1925.

Polygonum amphibium var. *natans* f. *emersum* (Mx) Farwell. This plant was collected at Dearborn in a hollow containing water early in the season, but which was dry

later. The early plants had the usual aquatic leaf-form, i. e., smooth, cordate-ovate leaves on the lower part of the stems, the others being of the terrestial form. No. 7403, June 10.

Chenopodium Boscianum Moq. At Flat Rock. Scarce. No. 7496, July 29. Not listed in the "Mich. Flora."

Chenopodium Botrys Linn. Jerusalem Oak. Frequent along the shores of Torch Lake, No. 7468, July 20, 1925; Keweenaw Co., No. 1477a, June 27, '95; Detroit, No. 1477, Aug. 13, '94.

Corispermum Hyssopifolium Linn. Bugseed. This plant is now abundant in the sand pits northwest of Rochester. In 1919 it was scarce and the plants were small and simple. It now rivals the Russian Thistle in size, habit and abundance. No. 7671, Sept. 30. *Farwell and Walpole* collected it here, No. 5389, Sept. 4, 1919. I collected it at Detroit, No. 1690, Oct. 2, '00.

Allionia Gladewitzii Farwell. Excellent specimens of this were found at Sheldon, No. 7509, Aug. 12, 1925.

Dianthus Armeria Linn. Depford Pink. Roadsides near Algonac, No. 7417, June 17; Maybee, No. 7439, June 24: we collected it near Monroe, No. 5833, June 9, 1921, and at Metamora, No. 6651, July 18, 1723. Collected previously by myself at Detroit, No. 1672, June 16, 1900, and at Royal Oak, No. 5588, Aug. 12, '20. Usually it is found in sandy grounds along roadsides, but may be found also in grassy grounds and in open woods.

Dianthus deltoides Linn. Maiden Pink. At Clifton it is quite frequent over a stretch of half a mile. No. 7484, July 21, 1795; No. 3061, Aug. 22, '12; and No. 2196, Oct. 5, '10.

Dianthus barbatus Linn. Sweet William. At Eagle River, as an escape, No. 7487, July 21, 1925; Clifton, No. 284, July 26, '85; Belle Isle, No. 284a, June 22, '94; Algonac, No. 3208, Oct. 13, '13.

Portulaca oleracea Linn, var. *sativa* (Haw.) Dc. (*P. neglecta* Mackenzie and Bush). Very fleshy, leaves often two inches long by two thirds as wide at the refuse or emarginate apex, stamens 16, stems ascending or becoming prostrate. Dearborn, No. 7511, and Eloise, No. 7518, Aug. 5th.

Ranunculus Delphinifolius Torr. This species was found

in a stagnant pool along the Grand Trunk Western road in West Bloomfield in both flowering and fruiting condition. No. 7395, June 3. Previously collected at Detroit, No. 1892, May 27, '05; Washington, No. 4154, May 25, '16; Cass Lake, No. 4250, June 29, '16; La Salle, No. 5755, May 19, '21. A very small, pubescent form, creeping on muddy grounds is var. *terrestris* (A. Gr.) Farwell. Dearborn, No. 7402, June 10. Previously collected on Belle Isle, No. 1366, June 15, '93; Rochester, No. 4576, June 12, '17; Utica, No. 6307, Aug. 2, '22.

Syndesmon Thalictroides (L.) Hoffmg. Rue Anemone. The typical form of the species with the involucre composed apparently of a number of simple, petioled leaves. The first time I have seen it in Michigan. Commerce, No. 7383, June 3.

Hydrastis Canadensis Linn. Golden Seal. In woods at Commerce. From one to two score plants are here. The flowering season had passed. No. 7386, June 3.

Asimina triloba (Linn) Dun. Papaw. A large grove of this species covers the banks of the River Rouge near Dearborn. At this time of the year the young fruits were from one to two inches in length. No. 7513, Aug. 6. It was collected here July 8, 1917, No. 4515b. Also, at Detroit, No. 4470, June 2, 1917.

Papaver Rhoeas Linn. Corn Poppy. An escape along the shores of Torch Lake, No. 7466, July 20, 1925. Detroit, in waste grounds, No. 2876, July 18, '12.

Argemone intermedia Sweet. Prickly Poppy. This was found at Flat Rock. Probably an escape from cultivation. No. 7463, found at Flat Rock. Probably an escape from cultivation. No. 7463, July 1.

Brassica Napus Linn. Rape, Cole. Very much like *B. campestris* but entirely glabrous, larger and fleshier, the woody tap root is larger, about as large as the finger. Waste grounds at Dearborn, No. 7505, Aug. 5. The var. *Napo-Brassica* (L.) Reichb. was observed along railroad banks at Sheldon, Aug. 12, 1925. In this the long conical tap root was not woody nor larger at the top than an inch in diameter, and all the leaves were glabrous, glaucous, and run-

cinate pinnatified. As it was not in flower, no specimens were collected.

Brassica compestris Linn. Field Cabbage. Glaucous and more or less hispidulous on the lower parts. Leaves cordate clasping, lowermost runcinate. Collected at Lake Linden, No. 7470, July 20, 1925; Keweenaw Co., No. 160, Aug. 10, 1884; Ypsilanti, No. 160a, June 18, 1892; Detroit, No. 160b, July 15, 1893. Frequent in waste grounds throughout the state.

Hirschfeldia Gallica (Wild.) Farwell. In waste grounds at Flat Rock, No. 7461, July 1.

Conringia orientalis (L.) Dum. Hare's-ear Mustard. A luxuriant form. Flat Rock, No. 7462, July 1. Also in Keweenaw Co., No. 837, Aug. '94; Dearborn, No. 4516, July 8, '17; Rochester, No. 4506, June 28, '17.

Radicula sylvestris (Linn) Druce. On roadsides and in waste grounds at Flat Rock. Nos. 7453 and 7454, July 1.

Barbarea verna (Mill.) Asch. Scurvy Grass. Rarely seen and only in small amounts. Eloise, No. 7352, May 20.

Dentaria diphylla Mx. Pepperroot. The stem of this species has two leaves opposite or nearly so, usually three-foliolate. At Milan we found a large stand of it in full bloom. The stem leaves, however, varied from simple and toothed through all stages of subdivision to 3-foliolate, some of them even being bilobed. No. 7309, May 6.

Arabis laevigata (Muhl.) Poir., var. *heterophylla* (Nutt.) Farwell. This var. has the lower part of the plant and the rosette leaves spreading pubescent. Roadsides in Nankin, No. 7405, June 10.

Sedum Telephium Linn, var. *purpureum* Linn. [*S. triphyllum* (Haw.) S. F. Gray; *S. Fabaria* Koch, (1837); *S. purpurascens* Koch, (1843)]. Orpine; Liveforever. This plant is well scattered over Michigan. The leaves vary from ovate to broadly ovate, the uppermost being rounded at base and sessile, while the lowermost are narrowed into a short petiole; on some plants, the leaves are dense and subternate, longest at the middle of the stem, thence gradually reducing each way, the stem ending in a strictly terminal, dense, leafless compound cyme; others have the leaves more separated, of about the same length throughout, opposite or alternate,

the stem ending in a loose, leafy-bracted, compound cyme of both terminal and axillary elements. Denton, Nos. 7518 and 7517, August 12, 1925. Previously reported as var. *Fabaria* (Koch) Steud.

Ribes triste Pall., var. *albinervium* (Mx.) Fernald. This is our native Red Currant, found in rich woods and along the banks of streams, etc. Near Utica, No. 7334, May 13. It has been collected before in Keweenaw Co., No. 20, June 18, '83. At Oxford, No. 5221, May 27, '19; and at Bloomfield, No. 4429, May 13, '17.

Ribes odoratum, Wendl. Buffalo Currant. Cultivated. Also along a roadside fence row where the indications were that it was an escape from cultivation. Near Utica, No. 7321, May 13. It has been collected before in similar situations, at Ypsilanti, No. 1104, April 20, '91; Dead Lake, No. 1104a, July 16, '09; Rochester, No. 2568, May 19, '12; Orion, No. 6907, June 4, '24. We also found this as an escape and intermixed with the dwarf *Shadbush* on the Disco Road, No. 7597, Aug. 26.

Geum Canadense Jacq., var. *camporum* (Rydb.) Fernald & Weath. The plant previously reported as var. *flavum* (Porter) Britt. belongs here. The petals were pale yellow, but probably this color was the result of fading. This variety was collected near Disco, No. 7525, Aug. 19.

Geum Virginianum Linn. Rough Avens. Very common. Dearborn, No. 7404, June 10, '25. We have collected it at La Salle, No. 6293, July 26, '22, and at Monroe, No. 6706, Aug. 22, '23. I have collected it at Ypsilanti, No. 5250a, June 15, '19, at Mt. Clemens, No. 6377, Aug. 25, '22, at Parkedale, No. 2761, June 30, '12, and on Belle Isle, No. 1401, July 21, '93.

Geum Virginianum var. *Murrayanum* Fernald. This is a variation with perfectly glabrous fruit. I have found it only at Erie, No. 6640, July 11, 1923. The plant previously reported as this variety is the typical form of the species, setose on the back, at the top of the fruit and around the base of the style.

Geum macrophyllum Willd. Very rare. Near Disco, No. 7526, Aug. 19.

Rubus neglectus Peck. Plant similar to *R. occidentalis*

but with the prickles of *R. strigosus*. Dearborn, No. 7507, August 5.

Rosa Damascena Mill. The Damask Rose. Near the cellar remains of an old residence at Nankin. Probably once cultivated but now persistent; perhaps 15 years since it received cultivational care. The stem is green, a foot or so high, entirely smooth; the 7-9 leaflets are simply serrate and more or less pubescent beneath; the pedices and hip are glandular and the three outer sepals are pinnatifid. No. 7415, June 10. With it was *Rosa blanda* Ait., No. 7414.

Rosa Virginiana Mill. var. *vulgaris* (Crepin) n. comb. (*R. parviflora* var. *vulgaris* Crepin) sub. var. *villosa* (Best) [*R. humilis* var. *villosa* Best in Bull. Tor. Club XIV (1887) 256. *R. Lyoni* Pursh. Fl. Amer. Sept. (1814) 345]. Leaves pubescent underneath. Banks and dry grounds at Geddes, No. 7691, Oct. 14, 1925.

Rosa Virginiana Mill., var. *glandulosa* (Crepin) Farwell. Associated with the above. No. 7690.

C. Crus-galli Linn, var. *Prunifolia* (Marsh.) Loudon. (*C. Farwellii* Sargt.) Corymbs pubescent, leaves broadly obovate. On exposed hilltops near Oxford; the first time I have seen it in another place than on Belle Isle. No. 7614, Sept. 2.

Crataegus Grayana Eggelston. A peculiar species having the points of many of the leaf-lobes recurved. Farmington, No. 7622, Sept. 9, '25.

Crataegus Alnorum Sarg. Some of the leaves are broader than long and all the fruit examined had but two nutlets each. Near Goodrich, No. 7637, Sept. 23.

Crataegus filipes Ashe. (*C. opulens* Sargt.) On hillsides at Rochester. Some of the leaves are very deeply threelobed. No. 7664, Sept. 30. Previously collected at Parkdale, No. 3270, Oct. 27, '12.

Crataegus Acerifolia Moench. The flowers of this species have a very unpleasant odor. Near Milan, No. 7308, May 6.

Crataegus macracantha Lodd., var. *succulenta* (Schrad.) Eggelst. Flowers May 27, and fruit Oct. 14, 1925. Ypsilanti, No. 7367. The knife dropped here when the flowers were collected was not in evidence when the fruit was gathered.

Pyrus Prunifolia Willd. Crab Apple. A tree about 20 ft.

high with an equal spread of branches; leaves from 1 to 4 inches long, obovate, oval, suborbicular or ovate, glabrous or with a trace of pubescence at the base of the blade on the under side, on glabrous or pubescent petioles up to 1.5 inches long; yellow fruit, globular or ovoid, .75 to 1.25 inches with persistant calyx and cavity at base on glabrous or pubescent peduncles about .75 inch long. A roadside tree and apparently an escape, as there are no orchards anywhere near. On the Disco Road, No. 7598, July 26.

Lupinus perennis Linn, f. *albiracemus* A. H. Moore. This white flowered form was again collected, this time at West Bloomfield; No. 7396, June 3.

Melilotus Melilotus-officinalis (L.) Asch. & Graebn., var. *confertus* (O. E. Schulz) Asch. & Graebn. Dearborn, No. 7506, Aug. 5. Nankin, No. 7517, Aug. 5.

Melilotus Melilotus-officinalis (L.) Asch. & Graebn., var. *arvensis* (O. E. Schulz) Asch. & Graebn. Sheldon, No. 7513, Aug. 12, 1925.

Trifolium procumbens Linn. Small Hop Clover. Not as widely distributed as the *T. agrarium* nor as frequent. Rochester, No. 2196, July 24, '10; River Rouge, No. 5140, Sept. 15, '18; Ypsilanti, No. 5745, May 15, '21; Farmington, No. 7624, Sept. 9, '25.

Robinia Pseudo-Acacia Linn. Black Locust. At West Bloomfield in a situation where the probabilities are against its being a cultivated plant. Either native or naturalized. No. 7400, June 3.

Meibomia rotundifolia (Mx.) OK. Tick Trefoil. In dry hardwoods. Rare. Oxford, No. 7613, Sept. 9. It has been collected at Orion, No. 918, Aug. 29, '95, and at Royal Oak, No. 5589c. Aug. 12, '20.

Lespedeza violacea (L.) Pers. Bush Clover. This Species, rare in Michigan so far as my experience goes, was found at Geddes in good fruit. No. 7692, Oct. 14, 1925.

Pisum sativum Linn. The Garden Pea. It was found in wild or uncultivated fields near Rochester, No. 7659, Sept. 30.

Lathyrus palustris Linn., var. *linearifolius* Ser. In fields near Algonac. No. 7432, June 17.

Lathyrus venosus Muhl., var. *intonsus* Butters and St. John. Said to be infrequent but found throughout the State;

the buds are white and the flowers bluish-purple and white. Banks and hillsides in more or less shade. West Bloomfield, No. 7398, June 3. A form with the buds and upper part of the calices a bright rose red and with rose-purple flowers may be known as forma *roseus* n. f. West Bloomfield, No. 7399, June 3.

Oxalis corniculata Linn., var. *Dillenii* (Jacq.) Trelease. [*Oxalis Dillenii* Jacq., Oxal. (1794) 28; *Oxys lutea Americana* etc. Dill. Hort Elth. (1732) 298 t. 221, f. 288; *O. stricta* Linn Sp. Pl. (1853) I 435 as to the Gronovian synonym; *O. corniculata* var. B. Linn. Sp. Pl. (1762) I 623.] Under the Vienna Rules Article 46, when an author unites two or more species of the same date, he chooses the name and that choice cannot be modified by subsequent authors. Presumably, this rule holds true for the reverse action, i. e., when a species is divided, the author leaves the name for that part of the aggregate which, judging by its name or description, is the origin of the species; if there is no such indication, the author chooses and his choice cannot be modified. In the case of *Oxalis stricta* Linn, there are three synonyms cited; but *no description that is original* with the Species Plantarum. There is nothing in one synonym over the others to indicate which one gave rise to the specific name *stricta*. As *O. stricta* is an aggregate, the author first dividing it, chooses that part to which the name *stricta* belongs, and that choice cannot be modified. When Jacquin published his *O. Dillenii* in 1794, based upon figure 288 of Dillenius, the Gronovian synonym which is conceded by all to be identical, automatically was removed from *O. stricta*, leaving that name for the synonym of Morison. Furthermore, Linnaeus, himself, placed the Dillenian species, identical with the Gronovian, as var. *B.* under his *O. corniculata* which action indicates that he probably considered the Morison synonym as representative of his *O. stricta*. Therefore, *O. stricta* under the Vienna Rules interpreted as above, is the proper name for the cymosely-flowered plant recently described as *O. cymosa* by Small, and more remotely as *O. Europoea* by Jordan.

Now, if we look at the American Code, we find that Canon 14 (c) provides that in default of an originally cited speci-

men as the type, the first cited identifiable figure is to be considered as the specific type of the species. Therefore, the Morison citation, with an identifiable figure, must be considered as the type of *O. stricta* Linn. According to Dr. B. L. Robinson, this figure is clearly the cymose-flowered species called *O. cymosa* by Small. Thus, by both the systems of nomenclatorial rules used in this country, the common cymose-flowered, yellow *Oxalis* is the type of *O. stricta* Linn.

In referring to the Vienna rules above, I purposely used the word presumably, for the rules are silent about the points involved. The next International Congress might remedy their rules regarding the conservation of the specific name, when an aggregate is divided, so I suggest the following as supplemental:

(a) The specific name shall be retained for that part of the species which gave rise to it if that is determinable.

(b) When it cannot be determined what part of the aggregate gave rise to the specific name, the latter shall go with the oldest synonym that carries an identifiable figure, if there is such.

(c) When neither *a* nor *b* applies, the identifiable synonym that is oldest in point of pubilcation shall be considered the type to which the specific name shall apply. The above refer particularly to the publication of species based upon citations and without original descriptions, as in the case of *Oxalis stricta* Linn. I have collected this variety as follows: Royal Oak No. 4557, Sept. 8, '17; Dearborn, No. 4660, Sept. 29, '17. The form without villous hairs on the capsules may be known as subvariety *piletocarpa* (Wieg.) n. comb. *O. stricta* var. *piletocarpa* Wieg. in Rhodora XXVII (1925) 123. I have collected it at Rochester, No. 1524, July 4, '96, and No. 4502 1-3, June 17, '17; Belle Isle, No. 1524a, June 14, '01; Dearborn, No. 4530 1-2, July 14, '17; Oxford, No. 6413, Oct. 4, '22 and No. 7617, Sept. 2, '25; Farmington Junction, No. 7631, Sept. 9, '25; Parkedale, No. 2671, June 11, '12; Algonac No. 2712, June 16, '12.

Euphorbia dentata Mx., var. *lancifolia* Farwell. This is the narrow leaved form of the species and was found on railway banks at Oxford; No. 7602, Sept. 2.

Negundo Fraxinifolium (Nutt.) n. comb. *Acer Fraxinifolium* Nutt. Gen. I (1818) 253; *Rulac Nuttallii* Nieuwl. in Amer. Mid. Nat. II (1911) 137; *Negundo Nuttallii* Rydb. in Bull. Tor. Bot. Club XL (1913) 55; *Acer Negundo* var. *violacem* Kirchner. Box Elder. This species differs from *N. Negundo* in its glabrous fruits in its glaucous-blue branchlets and petioles. Keweenaw Co., No. 803, Aug. 21, 1890. Ypsilanti, No. 803a, May 12, 1891, and May 27, 1925; Detroit, No. 803b, June 21, 1901; Stony Creek, No. 3341, May 4, 1913; banks of the Raisin River at Monroe, No. 7305, April 29, 1925, and Maybee, No. 7445, June 24, where it is planted as a shade tree along the roads; Calumet, No. 7491, July 21, 1925. This species is in general cultivation in Michigan. The seed germinates readily and young trees from self sown seed are found in abundance. Young fruits are more or less glaucous, also.

Vitis aestivalis Mx. Fence rows along roadsides at Oxford. Evidently a cultivated grape that has escaped. No. 6674, August 18, 1923; fruit, September 2, 1925.

Malva moschata Linn. Musk Mallow. In the typical form the root leaves are reniform and coarsely, palmately toothed or parted and the uppermost stem leaves are palmately divided with the divisions toothed; the flowers are pale rose or pink. It has been collected at Oxford, No. 5617, August 22, 1920; at Shelbyville, No. 6572a, June 21, 1923; at Almont, No. 6271g, July 19, '22; at Amy, No. 6965, July 9, 1924.

Malva moschata var. *undulata* Sims. In this variety the root-leaves are orbicular with a crenate margin and the upper stem leaves are palmately divided, the divisions being once or twice pinnatifid; the flowers are white. It has been collected at Junior, No. 5077, July 13, '18; at Lake Linden, No. 5965, August 10, '21, and No. 7475, July 20, '25; at Shelbyville, No. 6572b, June 21, '23.

Viola nephrophylla Greene. Rich woodlands near Milan, No. 7318, May 6. This is associated with *V. communis* but it is scarce while that is abundant. The oblong and obtuse sepals and the bearded spur petal distinguishes it. Also at Inkster in similar situations, No. 7343, May 20.

Viola latiuscula Greene. Sandy grounds in dry woods

near Eloise. The purplish color on the under side of the leaves had nearly disappeared at this time of the year. No. 7358, May 20.

Viola domestica Bickn., var. *communis* (Pollard) Farwell. Our commonest violet. Monroe, No. 7300, April 29, '25; in rich woodlands near Milan, No. 7319, May 6. Forma *alba* (T. and Gr.) Farwell was found near Milan, No. 7310, May 6 and Utica, No. 7339, May 13. The flowers of No. 7339 were pure white except for the veins and the spur while those of No. 7310 had more color, the base of all the petals being of a pale violet blue.

Viola Dicksonii Greene. A near relative of *V. cuspidata.* In woods at Inkster, No. 7346, May 20 and at Algonac, No. 7427, June 17. *V. Missouriensis* Greene?

Viola fimbriatula Sm. The larger plants simulate very closely the Arrow Violet, especially during the summer, when the leaves have elongated petioles, much longer than the blades. Near Monroe, No. 7307, April 29, '25. At Eloise, on sandy hills, we found typically pure *V. fimbriatula* with rather broad, glossy leaves, which had no petioles longer than the blade. No. 7362, May 20. Mr. Gladewitz found it here twelve years ago, when it was more plentiful than now.

Viola lanceolata Linn. On moist grounds covered with Steeple Bush and other low shrubs near Eloise where it is now abundant though when Mr. Gladewitz discovered this station some twelve years ago there was scarcely a dozen plants at that time. No. 7354, May 20.

Dirca palustris Linn. Leatherwood. In rich woods near Utica, No. 7335, May 13. It has been collected before in Keweenaw County, No. 231, June 20, '85; at Redford, No. 4421 1-2, April 29, '17.

Epilobium adenocaulon Haussk., var. *perplexans* Trelease. Has flaccid leaves. Cedar swamps near Oxford, No. 7606, September 2.

Oenothera laciniata Linn. In yellow sand at Algonac, June 17. It was collected here by *Billington, Walpole and Farwell,* No. 5500, June 20, 1920, and by me at Detroit No. 1468, July 5, 1894.

Oenothera perennis Linn. In open, low grounds near Eloise. The stems are grayish with appressed pubescence

rather than *puberulent* as the manual has it. Mr. Gladewitz discovered it at this station, some twelve years ago. No. 7407, June 10. Previously collected in Keweenaw County, No. 855, July 5, '95.

Panax quinquefolium Linn. Ginseng. Some seven or eight plants were observed; the flower buds were well developed. Milan, No. 7320, May 6.

Chaerophyllum procumbens (Linn) Crantz. This is found on alluvial grounds. South Rockford, No. 4151, May 21, 1916; Redford, No. 4857, May 24, 1918; Monroe, No. 7299; April 29, 1925. These stations are in the valleys of the Huron, Rouge and Raisin rivers respectively.

Uraspermum dulce (Muhl.) Farwell, var. *laevicaule* Farwell. A new station for this nearly glabrous variety was found in woods at Inkster, No. 7348, May 20.

Uraspermum aristatum (Thnb.) O.K., var. *villicaule* (Fernald) Farwell. A new station for this villous variety was discovered at Ypsilanti, close to a fence in the outlying district towards Geddes. No. 7370, May 27, 1925.

Levisticum Levisticum (Linn) Karst. Lovage. Lake Linden, No. 7477 1-2, July 20, 1925. It was collected here, No. 1615a, August 25, '98.

Aegopodium Podagraria Linn, var. *variegatum* Bailey. Goutweed. Common in cultivation and as an escape at Marine City. On the banks of the Bell river. *Farwell and Gladewitz,* No. 6732 1-2, August 29, '23.

Monotropa Hypopithys Linn. The European type is not found in this country; it is glabrous except for the inner surface of the petals, stamens, ovary, style and stigma, which are pubescent, the latter with a retrorse beard. Its American representative has been describd as *M. lanuginosa,* but it is scarcly of specific distinction; it is somewhat smaller, is more or less crimson or yellowish, and pubescent throughout. It may be known as var. *rubra* (Torr.) n. comb. [*M. lanuginosa* Mx. var. *rubra* Torr. in *Flora N. Y.* I (1843) 457 and Pl. 72.] Another variation has less pubescence, is more often yellow or pinkish, and the stigma is without a retrorse beard. It may be known as var. *Americana* (D. C.) n. comb. [*Hypopithys Europaea* Nutt. Genera I (1818)271; *H. multiflora* var. *Americana* D. C. in Prodr. VII pt. 2

(1839) 780; *M. lanuginosa* var. *glabriuscula* Torr., l. c.] The part of the stem, often one half of it, below the surface, is ivory white, as in *M. uniflora*. Dry woods near Oxford; No. 7612, Sept. 2. Michigan is within the range given for each of these varieties, but I have detected only this one. Also Keweenaw Co., No. 331, Aug. 16, 1885. This species is the type of the subgenus *Hypopithys* Torr. l. c. usually accredited to A. Gr. of a later date. The var. *Americana* is recognized by some authors as a good species under the name *Hypopithys Americana* (D. C.) Small. But Nuttall's name, unquestionably applied to this plant and valid for it, is much older, yet perhaps not the oldest given it. Rafinesque published in 1810 four or five species of *Hypopithis*, one of which might apply to it.

Samolus floribunda HBK. Water Pimpernel. Borders of depressions containing water. Near Dearborn, No. 7514, Aug. 6.

Gentiana flavida A. Gr. This species is rather plentiful on high, dry grounds at Superior, No. 7688, Oct. 14, '25.

Apocynum pubescens R. Br. Indian Hemp. The calyx lobes and pedicels are pubescent and the leaves are rather densely white pubescent beneath. The first time observed in Michigan, though another species many years ago was collected for it. On roadsides and banks, Maybee, No. 7438, June 24; Flat Rock, No. 7451, July 1.

Ipomoea purpurea (Linn) Roth. Morning Glory. This was found in fields near Rochester as an escape from cultivation, probably. No. 7660, Sept. 30. In similar situations at Goodison, Sept. 30.

Ipomoea pandurata (L.) G. F. W. Mey. Manroot. This is an extensive vine with coarse stems either twining or trailing, often many yards in length. The root is used in medicine to some extent. Raisinville, No. 7500, July 29.

Verbena stricta Vent. Hoary Vervain. This is one of our less frequent species of vervains. Generally found in dry grounds, such as hillsides, etc. Nankin, No. 7516, Aug. 5. Previously at Pontiac, No. 6359, Aug. 16, '22, and on Belle Isle, No. 1766, Sept. 28, '01.

Moldavica parviflora (Nutt.) Britt. Dragonhead. This

was found in sandy grounds at Flat Rock, the first time met with in Michigan, No. 7493, July 29.

Moldavica Moldavica (L.) Britt. Dragonhead. This species was collected in Keweenaw Co., No. 1827, August, '04. Previously but wrongly reported as the preceding species.

Lamium amplexicaule Linn. Dead Nettle. At Commerce, this species was quite plentiful in ground that had once been cultivated. No. 7387, June 34.

Salvia officinalis Linn, var. *tenuior* Alef. Domestic Sage. Cultivated in America for commercial purposes. An escape at Nankin. No. 7410, June 10. Previously collected at Island Lake, No. 1924, July 16, '05.

Physalis grandiflora Hook. Ground Cherry. In clearings, fields, and old gardens. Scarce. Phoenix, No. 286, Aug. 1, '85.

Physalis Philadelphica Lam. (*P. subglabrata* Mackenzie and Bush.) In fields and rather frequent. On Belle Isle, No. 1554, Sept. 10, '96; Monroe Piers, No. 5567, Aug. 8, '20; La Salle, No. 6280d, July 26, '22; Ypsilanti, No. 6331, Aug. 9, '22; Farmington, Nos. 7625 and 7628, Sept. 9, '25.

Physalis Virginiana Mill. The typical form with long soft hairs. Near Disco. No. 7591, Aug. 26. I have collected it at Clifton, No. 285, July 26, '85, and at Island Lake, No. 285a, July 16, '05.

Physalis Virginiana var. *vulgaris* Rydb. The more common form with less pubescence of short recurved hairs. Near Disco, No. 7595 1-2, Aug. 26. This was collected here by *Brotherton and Farwell*, No. 285b, July 24, '10. We have collected it also at Trenton, No. 5932, July 26, '21, and at Monroe, No. 6710, Aug. 22, '23.

Physalis Virginiana f. *sanguinea* Farwell. This has a red striped stem and red veins. Belle Isle, No. 1428, Aug. 30, '93, and Trenton, No. 5932a, July 26, '21.

Physalis lanceolata Mx. Detroit, No. 3980, June 19, '15.

Physalis heterophylla Nees. Perhaps our commonest species of ground cherry. Disco Road, No. 7594 and Stony Creek, No. 7599, August 26. Previously at Detroit No. 1377, June 22, '93; Orion, No. 1377a, August 29, '95; Parkedale, No. 1377b, June 23, '09; Rochester, No. 2951, July 28, '12.

Physalis heterophylla var. *ambigua* (A Gr.) Rydb. More

abundant than the specific type. Stony Creek, No. 7601, Aug. 26. Previously at Clifton, No. 623, July 26, '88; on Belle Isle, No. 623a, September 10, '96; Parkedale, No. 623b, June 30, '09; River Rouge, No. 4117, Sept. 30, '15; Goodison, No. 6384, Sept. 4, '19; Oxford, No. 6923, June 25, '24.

Physalis heterophylla var. *Nyctaginea* (Dun.) Rydb. The least frequent form. Again collected, this time at Farmington, Nos. 7626 and 7629, September 9, '25.

Pedicularis Canadensis Linn. Lousewort. A very common plant in copses and on banks. Near Utica, No. 7330, May 13. It has been collected before as follows: Keweenaw County, No. 768, July 25, '90; Ypsilanti, No. 768a, May 11, '91; Detroit, No. 768b, June 2, '93; Orion, No. 768c, May 30, '95; Parkedale, No. 3395, May 25, '13, and No. 3847, Aug. 23, '14.

Pedicularis Canadensis f. *preclara* A. H. Moore. A red flowered form of the Lousewort. With the species but not so common. Near Utica, No. 7331, May 13. It has been collected before at Parkedale, No. 3965, June 6, '15.

Plnatago major Linn, var. *minima* (D. C.) Dcne. A very small state of the species with mostly small entire or denticulate suborbicular, ovate or oval leaves on very short petioles and peduncles shorter than the leaves, the ovoid, capitate or oblong spikes slightly overtopping them or some shorter. Belle Isle, No. 1864, August 30, '04. Algonac, *Gladewitz and Farwell*, No. 7081, September 3, '24. Shores of Torch Lake, No. 7469, July 20, 1925. In sand pits at Rochester, No. 7663, September 30.

Plantago major Linn, var *paniculata* Dcne. The form in which the spike, often branched, has foliaceous bracts at its base. Frequent throughout. Shores of Torch Lake, No. 7473, July 20, 1925.

Plantago Purshii R. & S. In yellow sand that was once beach sand. Algonac, No. 7419, June 17.

Plantago Virginica Linn. With the preceding species. No. 7420, June 17.

Galium circaezans Mx., var. *glabrum* Britt. Wild Licorice. The whole plant is very sparingly pubescent and the flowers are glabrous. In thin, grassy woods at Maybee, No. 7441, June 24.

Sambucus racemosa Linn, var. *pubens* (Mx.) Koehne. Redberried Elder. The leaves vary in shape and color but usually the leaves of an individual plant are alike. They are narrowly ovate-lanceolate, long-acuminate, yellowish green, pubescent; or oval, short acuminate, the terminal often obovate or oblanceolate, dark-green above and very pale beneath, glabrate. Both forms are found near Milan, but not in the same woods. The former, No. 7312 and the latter No. 7313, May 6.

Viburnum Acerifolium Linn, var. *ovatum* Rehder. This variation with ovate, undivided leaves was found by *Billington, Farwell and Gladewitz* in woods near Lakeville, No. 6443 1-2, October 11, '22, and by *Farwell and Gladewitz* at Northville, No. 6457, October 18, '22. The variety, as found here in Michigan, will generally show two or three leaves on each shrub that are 3-lobed, as in the typical species.

Lonicera Morrowii A. Gr. Looks much like *L. Tartarica* but the leaves are very pubescent and the white flowers tinged with red quickly fade yellow. An escape to the banks of the Huron river at Ypsilanti. No. 7364, May 27, 1925.

Cucumis sativus Linn. Cucumber. Waste grounds and roadsides near Sheldon, No. 7510, August 12, 1925.

Specularia perfoliata (Linn) A. DC. Venus' Looking Glass. Said to be scarce in Michigan. Usually it is found in sandy or gravelly grounds. Algonac, No. 7433, June 17. Associated with *Coreopsis grandiflora* and *Centaurea Cyanus* at Flat Rock, No. 7460, July 1; we collected it previously at South Rockwood, No. 5444 1-2, June 14, '21; also by myself on Belle Isle, No. 1461, June 22, '94; Parkedale Farm, No. 3471, June 15, '13 and No. 3515, July 20, '13.

Lobelia Kalmii Linn, var. *strictiflora* Rydb. There is in Michigan a small form of this species that agrees in every respect with the description of this variety. Clifton, No. 7480, July 21, '25; Farmington, September 9, 1925. The linear leaves and the flowers are erect, giving it a different aspect from the typical form of the species with these parts spreading.

Laciniaria Gladewitzii n. sp. An exact intermediate between *L. cylindracea* and *L. scariosa* var. *sphaeroidea* and probably a hybrid of these. Stem about 2.5 feet high, smooth

below, puberulent above; leaves smooth, the lower linear lanceolate 10 inches by .5 inch or less, the upper reduced and linear, punctate; spike of numerous, short peduncled, turbinate- cylindric heads, the involucral scales obovate, rounded at the apex, scarious margined, often colored; papus very plumose. It looks like a rather narrow leaved *L. sphaeroidea* with nearly the flower heads of *L. cylindracea*. Dry hills at Rochester, No. 7584, July 26. Associated with it were *L. cylindracea* (No. 7585), *L. scariosa* (No. 7586) and its var. *sphaeroidea* (No. 7587). Named for Mr. Bruno Gladewitz, who first observed its peculiarities and suggested its hybrid origin.

Grindelia squarrosa (Pursh) Dun. Gum Plant. It has been used in medicine in the treatment of intermittent fevers. In August, 1921, acres of it were observed in Newaygo Co., it has been collected at Marquette, No. 1836, Aug. '04; Detroit, No. 1836a, Aug. 11, '05; near Royal Oak, No. 4209, June 19, '16, and No. 4344, August. 10, '16.

Solidago lepida D. C. Banks and streams near Rochester, No. 7667, Sept. 30. The var. *fallax* Fernald was collected in Keweenaw Co., No. 491, Sept. 12, '86.

Solidago graminifolia (Linn) Salib. The typical form of the species was gathered at Clifton, No. 7481, July 21, 1925.

Aster Lowrieanus Porter. Frequent in copses near Rochester, Nos. 7655, blue-rayed and 7656 white-rayed, Sept. 30.

Aster laevis Linn, var. *panduratus* Farwell. Roadsides at Oxford. No. 7603, Sept. 2.

Aster laevis Linn, var. *thyrsoideus* Farwell. A low plant with a compact and small thyrsoid pannicle. Ypsilanti, No. 7687, Oct. 14, 1925.

Iva Xanthiifolia Nutt. Marsh Elder. At Flat Rock where some of the plants are 8 feet in height with leaves often 9 inches long and 8 wide. No. 7494, July 29.

Ambrosia coronopifolia T. & G. Ragweed. Previously reported as *A. psilostachya*. Rarely over a foot in height. Clifton, No. 1784 bis, July 21, 1925. It differs from *A. psilostachya* in its low stature, few or no papillate hairs, in its small staminate heads, and in its usually simple habit.

Rudbeckia hirta Linn. Black Eyed Susan. A very peculiar specimen of this species was gathered near Disco; it was stemless and had one head sessile in the middle of a rosette

of root leaves which had petioles of varying lengths. Near Disco, No. 7529, Aug. 19. Another form was observed at Rochester that had rays yellow and orange with a white band between.

Rudbeckia aspera Pers. We found two new stations for this Blackeyed Susan. Rochester, No. 7589, Aug. 26, and Goodison, No. 7673, Sept. 30.

Coreopsis tinctoria Nutt. Fields near the railway at Flat Rock, No. 7456, July 1.

Coreopsis coronata Hook. With the preceding. Scarce. No. 7455, July 1.

Coreopsis grandiflora Nutt. This plant has hairy stems and all the leaves are pinnatified. It covers an acre of ground, more or less, and is thoroughly established. The ground apparently was once under cultivation, but if so, it has long been abandoned as a garden. Flat Rock, No. 7457, July 1. It is said that Mr. Ford had about a bushel of seeds of various species planted here some three or four years ago, but most of them, left to themselves, have run out. The above have persisted; but the *C. coronata* probably will disappear in another year or two.

Artemisia Absinthium Linn. Wormwood. Occasional throughout the State. Frequent along roadsides near Goodrich, No. 7645, September 23. I have it from Clifton, No. 834, August 30, '90; Lake Linden, No. 5966, August 10, '21; Calumet, No. 5974, August 17, '21; and Roseville, No. 6863, October 10, '23.

Gaillardia pulchella Foug. Cultivated and escaped near Rochester. Spreading. No. 7654, September 30. *Chandler and Gladewitz* found this in fields near Pontiac in 1919.

Matricaria suaveolens (Ph.) Buchenau. Along the railway tracks at Commerce where it gave evidence of becoming plentiful. No. 7382, June 3.

Chrysanthemum Parthenium (Linn) Bernh. The Feverfew of the gardens is an escape at Eagle River. No. 7490, July 21, 1925.

Cirsium Canadense (Linn) Scop., var. *integrifolium* Wimm. and Grab. This flat leaved form was collected along roadsides at Raisinville; No. 7498, July 29. The flower heads

are longer and more flask-shaped. Mr. Gladewitz collected it at Wayne, August 12, 1925.

Centaurea Cyanus Linn. Bachelor's Button. Associated with *Coreopsis grandiflora* at Flat Rock, No. 7459, July 1.

Cochorium Intybbs Linn, var. *divaricata* DC. Chicory. This is a variety with many of the flowers on clubshaped peduncles. Near Sheldon, No. 7511, August 12, 1925; Detroit, No. 1650, August 4, '99.

Sonchus arvensis Linn, var. *maritima* Wahl. Green, not glaucous, peduncles and involucres glandless. Very variable in the size of its leaves on plants growing side by side (5 ins. by .75 to 14.5 by 3.5), mostly undivided, oblong-lanceolate or lanceolate. A large stand of it at Washington, No. 7523, August 19.

Lactuca Serriola Linn. Prickly Lettuce. Everywhere common. This specific name has seven years' priority over that of *Scariola* and is the name to be adopted. Leaves, obovate, pinnatified, vertical but usually some are horizontal and frequently the uppermost are oblong, entire and acute. The annual stems are simple, while the biennial plants may be branched at the base; some plants have entire leaves throughout but are to be placed here on account of the *obovate, obtuse* leaves, some of which may be slightly three lobed at the apex. Near Goodrich, No. 7638, September 23, Goodison, No. 7640, September 30. I have collected it at Rochester, No. 2091, June 30, '09; at Trenton, No. 2091a, August 8, '10; at Detroit, No. 2222 1-2, July 22, '11.

Lactuca Serriola var. *integrata* (Gren. and Godr.) n. comb. (*L. Scariola* var. *integrata* Gren. and Godr.) Leaves oblong, acute, none pinnatifid. More abundant than the specific type. Goodison, No. 7641, September 30. I have collected it at Ypsilanti, No. 1197, August 12, '91, and on Belle Isle, 1197a, August 12, '92. The variety *integrata* occasionally has all the leaves without prickles on the midrib underneath and this form may be known as subvar. *plicata* (Balb.) n. comb. (*L. plicata* Balb.) Goodrich, No. 7639. September 23.

OBITUARY

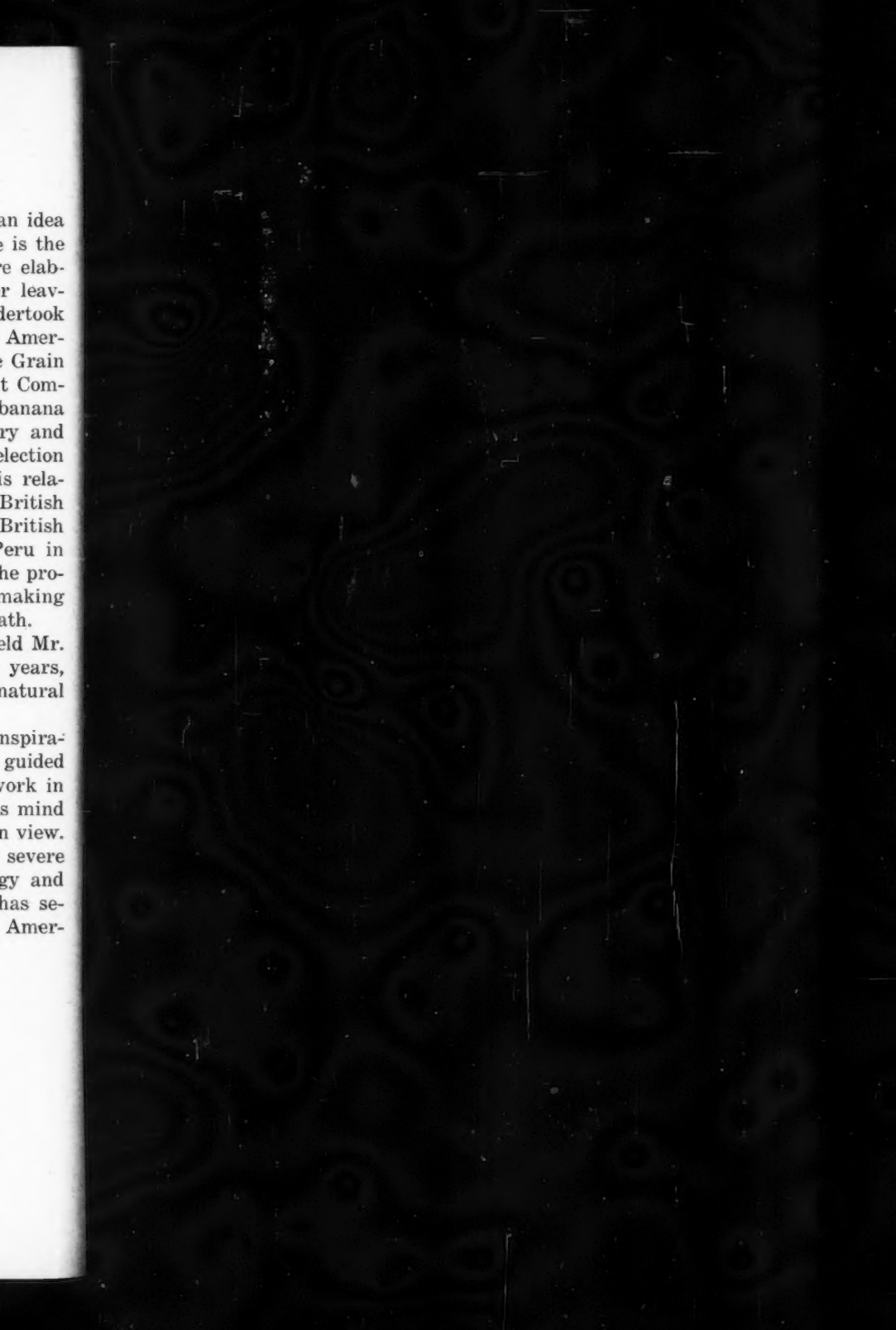
Mark Alfred Carleton, the well-known vegetable pathologist, died April 26 last year in Paita, Peru, from an attack of malaria. He was born near Jerusalem, Ohio, on the 7th of March, 1866. In 1876 his parents moved to a farm in Cloud County, Kansas. His early education was obtained in the rural schools of Ohio and Kansas. He entered the Kansas Agricultural College in 1884, graduating with the degree of Bachelor of Science in 1887. During 1890-1891 he was Professor of Natural History in Garfield University at Wichita, Kansas; during 1891 and 1892 he taught natural history in Wichita University, and during 1892-1893 took a graduate course in botany and horticulture at the Kansas Agricultural College, receiving the degree of Master of Science. During 1893 he was Assistant Botanist at the Kansas Experiment Station, giving special attention to plant pathology and particularly to cereal rusts. In March, 1894, Mr. Carleton began his service in the United States Department of Agriculture as Assistant Pathologist, and in 1901 he was appointed Cerealist in charge of Grain-investigations in the Bureau of Plant Industry, a position which he held until May 1918. During 1898 and 1900 he was an Agricultural Explorer in eastern Europe and Siberia, in search of rust-resisting and drought-resisting cereals.

Before entering the U. S. Department of Agriculture Mr. Carleton had published some reports on rusts of grains, several lists of Kansas Parasitic Fungi, and on various flowering plants of Oklahoma, etc. It was under the auspices of the Department of Agriculture that he published his excellent papers on plant pathology, establishing the physiological relationships of nearly all the cereal rusts of this country, and showing that durum wheats, emmer, einkorns and some other wheats are more or less rust-resistant.

It was Mr. Carleton who began the introduction of new varieties of cereals from Europe and Siberia into this country, and his work proved an immense success, His paper "The basis for the improvement of American wheats" (Wash-

ington 1900, Bull. 24, U. S. Dept. Agriculture) gives an idea of the magnitude of his work in this direction, and he is the author of a series of similar papers, all of which were elaborated with rare skill and extraordinary care. After leaving the service of the Department Mr. Carleton undertook some important work with the Grain Corporation of America, where he rendered excellent service. Leaving the Grain Corporation he entered the service of the United Fruit Company and was sent to Central America to study banana diseases. Near Port Limon he developed a laboratory and conducted some important field investigations in the selection of disease-resisting bananas. In 1922 he severed his relations with the Fruit Company, and was called to British Honduras for pathological work. He remained in British Honduras until December, 1924, when he went to Peru in connection with a large project having for its object the production of cotton and other crops in Peru, and was making special studies of cotton diseases at the time of his death.

It is indeed astonishing to see what an immense field Mr. Carleton covered in so short a period as twenty-five years, especially considering his very modest education in natural science.

Mr. Carleton was a very energetic man, full of inspiration and always active, and his keen eye for nature guided him to accomplish what he did. He performed his work in a purely scientific, very simple and quiet way, with his mind completely concentrated on whatever problem he had in view. His kind and friendly disposition makes his death a severe loss to his friends. His great work in plant pathology and his introduction of Eurasian cereals to this country has secured him a most prominent place in the history of American botany and American agriculture.

Theo. Holm, Clinton, Maryland.